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CDC Surveillance Summaries

July 1990

Reports on Selected Racial/Ethnic Groups

Special Focus: Maternal and Child Health

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Contribution of Birth Defects to Infant Mortality Among Racial/Ethnic Minority Groups, United States, 1983

Racial/Ethnic Differences in Smoking, Other Risk Factors, and Low Birth Weight Among Low-Income Pregnant Women, 1978-1988

Surveillance for AIDS and HIV Infection Among Black and Hispanic Children and Women of Childbearing Age, 1981-1989

Infant Mortality Among Racial/Ethnic Minority Groups, 1983-1984

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Foreword

Dynamic changes are occurring in the demographic structure of the U.S. population. Nowhere are these changes more dramatic than in the growth of certain racial/ethnic population groups. These changes, particularly as they relate to children, hold profound implications for our nation's health. Because children are our future, ensuring the health of children guarantees a healthy America. As Surgeon General, I place the highest priority on monitoring and improving the health status of all children and their mothers.

Today, more than ever before, we must focus our attention on the morbidity and mortality among the increasing numbers of minority children and mothers in the United States. For example, the life expectancy of black women is almost 5 years less than that of white women. Hispanic and black women and children have a seven to 13 times higher rate of AIDS than white women and children. And low birth weight rates continue to be twice as great among blacks as they are among whites.

The reports in this issue of *MMWR Surveillance Summaries* focus on major topics of public health surveillance among minority women and children. Timely identification of risk factors, documentation of mortality differences, and the demonstration of the need for prevention programs are essential if we are to succeed in reducing the burden of disease and injury among these groups. As public health practitioners, we must continue to strengthen our efforts to conduct effective surveillance of the health status of U.S. racial/ethnic minority groups.

Antonia C. Novello, M.D., M.P.H.
Surgeon General

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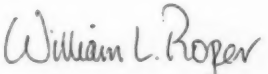
Preface

As the new Director of the Centers for Disease Control (CDC), I have identified three priority areas for CDC: first, strengthening the public health infrastructure—the people and systems needed to protect and promote the nation's health; second, enhancing CDC's national and worldwide leadership in prevention; and third, promoting the health of children. Efforts to address each of these priority areas will depend on effective public health surveillance—the ongoing collection, analysis, and dissemination of data in order to prevent disease and injury.

The *MMWR Surveillance Summaries* are published four times a year with the purpose of disseminating high-priority surveillance data to the public health community. This issue of the *Surveillance Summaries* focuses on the health of women and children in U.S. minority populations. All three of my priority areas are addressed in this issue—the development of infrastructure in the form of public health surveillance, the monitoring of the effectiveness of prevention programs, and the highlighting of the health of our youth.

I am pleased to join with Dr. Antonia Novello, the Surgeon General, in underscoring the importance of the public health community in preventing disease and injury, particularly as they relate to mothers and children in U.S. minority populations. This issue of the *Surveillance Summaries* reflects our ongoing commitment to prevention. I want sincerely to express my gratitude for the collaboration of our colleagues in state and local health departments and other members of the public health community. I look forward to comments on this and other issues of the *MMWR Surveillance Summaries* as we collaborate in the future to prevent illness and injury and to promote the public's health.



William L. Roper, M.D., M.P.H.
Director
Centers for Disease Control

Most Recent Reports Published in the *MMWR Surveillance Summaries*

Subject	Responsible CIO*	Most Recent Report
Abortion	CCDPHP	1990; Vol. 39, No. SS-2
AIDS/HIV		
Distribution by Racial/Ethnic Group	CID	1988; Vol. 37, No. SS-3
Among Black and Hispanic Children and Women of Childbearing Age	CEHIC	1990; Vol. 39, No. SS-3
Behavioral Risk Factors	CCDPHP	1990; Vol. 39, No. SS-2
Birth Defects		
B.D. Monitoring System (see also Malformations)	CEHIC	1983; Vol. 32, No. 1SS
Contribution of B.D. to Infant Mortality Among Minority Groups	CEHIC	1990; Vol. 39, No. SS-3
Campylobacter	CID	1988; Vol. 37, No. SS-2
Coal Workers' Health (see also Mining)	NIOSH	1985; Vol. 34, No. 1SS
Congenital Malformations, Minority Groups	CEHIC	1988; Vol. 37, No. SS-3
Dengue	CID	1985; Vol. 34, No. 2SS
Dental Caries and Periodontal Disease Among Mexican-American Children	CPS	1988; Vol. 37, No. SS-3
Ectopic Pregnancy	CCDPHP	1989; Vol. 38, No. SS-2
Ectopic Pregnancy, Mortality	CCDPHP	1987; Vol. 36, No. SS-2
Endometrial and Ovarian Cancers	EPO, CCDPHP	1986; Vol. 35, No. 2SS
Foodborne Disease	CID	1990; Vol. 39, No. SS-1
Gonococcal Infection	CPS, CID	1984; Vol. 33, No. 4SS
Gonorrhea and Salpingitis, Teenagers	CPS, CID	1983; Vol. 32, No. 3SS
Hepatitis	CID	1985; Vol. 34, No. 1SS
Hepatitis, Viral	CID	1983; Vol. 32, No. 2SS
Homicide	CCDPHP	1983; Vol. 32, No. 2SS
Homicides, Black Males	CEHIC	1988; Vol. 37, No. SS-1
Hysterectomy	CCDPHP	1986; Vol. 35, No. 1SS
Infant Mortality (see also National Infant Mortality; Birth Defects)	CEHIC	1990; Vol. 39, No. SS-3
Injury		
Death Rates, Blacks and Whites	CEHIC	1988; Vol. 37, No. SS-3
Drownings	CEHIC	1988; Vol. 37, No. SS-1
Falls, Deaths	CEHIC	1988; Vol. 37, No. SS-1
Firearm-Related Deaths, Unintentional	CEHIC	1988; Vol. 37, No. SS-1
In the Home, Persons Under 15 Years of Age	CEHIC	1988; Vol. 37, No. SS-1
Motor Vehicle-Related Deaths	CEHIC	1988; Vol. 37, No. SS-1
Objectives of Injury Control, State and Local	CEHIC	1988; Vol. 37, No. SS-1
Objectives of Injury Control, National	CEHIC	1988; Vol. 37, No. SS-1
Residential Fires, Deaths	CEHIC	1988; Vol. 37, No. SS-1
Tap Water Scalds	CEHIC	1988; Vol. 37, No. SS-1
Low Birth Weight	CCDPHP	1990; Vol. 39, No. SS-3
Malaria, Imported	CID	1983; Vol. 32, No. 3SS
Malformations (see also Birth Defects)	CEHIC	1985; Vol. 34, No. 2SS
Maternal Mortality	CCDPHP	1988, Vol. 37, No. SS-5
Mining (see also Coal Workers' Health)	NIOSH	1986; Vol. 35, No. 2SS
National Infant Mortality (see also Infant Mortality; Birth Defects	CCDPHP	1989; Vol. 38, No. SS-3

*All abbreviations are listed at end of inventory. Readers should check individual summaries when more than one CIO is responsible.

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Subject	Responsible CIO	Most Recent Report
Nosocomial Infection	CID	1986; Vol. 35, No. 1SS
Occupational Injuries/Disease		
Among Loggers	NIOSH	1983; Vol. 32, No. 3SS
Hazards, Occupational	NIOSH	1985; Vol. 34, No. 2SS
In Meatpacking Industry	NIOSH	1985; Vol. 34, No. 1SS
State Activities	NIOSH	1987; Vol. 36, No. SS-2
Treated in Hospital Emergency Rooms	NIOSH	1983; Vol. 32, No. 2SS
Ovarian Cancer (see Endometrial and Ovarian Cancer)		
Pediatric Nutrition	CCDPHP	1983; Vol. 32, No. 4SS
Pelvic Inflammatory Disease	CPS	1983; Vol. 32, No. 4SS
Plague	CID	1985; Vol. 34, No. 2SS
Plague, American Indians	CID	1988; Vol. 37, No. SS-3
Pneumoconiosis, Coal Miners	NIOSH	1983; Vol. 32, No. 1SS
Pregnancy, Teenage	CCDPHP	1987; Vol. 36, No. 1SS
Psittacosis	CID	1983; Vol. 32, No. 1SS
Rabies	CID	1989; Vol. 38, No. SS-1
Racial/Ethnic Minority Groups	Various	1990; Vol. 39, No. SS-3
Reye Syndrome	CID	1984; Vol. 33, No. 3SS
Rocky Mountain Spotted Fever	CID	1984; Vol. 33, No. 3SS
Rubella and Congenital Rubella	CPS	1984; Vol. 33, No. 4SS
Salmonella	CID	1988; Vol. 37, No. SS-2
Salpingitis (see Gonorrhea and Salpingitis)		
Smoking	CCDPHP	1990; Vol. 39, No. SS-3
Sudden Unexplained Death Syndrome Among Southeast Asian Refugees	CEHIC, CPS	1987, Vol. 36, No. 1SS
Suicides, Persons 15-24 Years of Age	CEHIC	1988; Vol. 37, No. SS-1
Summer Mortality	CEH	1983; Vol. 32, No. 1SS
Toxic-Shock Syndrome	CID	1984; Vol. 33, No. 3SS
Trichinosis	CID	1988; Vol. 37, No. SS-5
Tubal Sterilization Among Women	CCDPHP	1983; Vol. 32, No. 3SS
Water-Related Disease	CID	1990; Vol. 39, No. SS-1

Abbreviations

CCDPHP	Center for Chronic Disease Prevention and Health Promotion
CEHIC	Center for Environmental Health and Injury Control
CID	Center for Infectious Diseases
CIO	Centers/Institute/Offices
CPS	Center for Prevention Services
EPO	Epidemiology Program Office
NIOSH	National Institute for Occupational Safety and Health

Contribution of Birth Defects to Infant Mortality Among Racial/Ethnic Minority Groups, United States, 1983

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Summary

Linked birth/infant death data from the National Center for Health Statistics (NCHS) for the 1983 U.S. birth cohort, the latest year for which linked data were available, were evaluated in order to assess the contribution of birth defects to infant mortality among racial/ethnic groups. Of the 34,566 singleton infant deaths with specified birth weight born to U.S. residents, birth defects were listed as an underlying cause of death for 7,678 (22.2%) infants and as a contributing cause of death for an additional 1,006 (2.9%) infants. Infant mortality rates due to birth defects were highest among American Indians (2.9 deaths/1,000 live births), followed by Asians and Hispanics (2.6), and blacks (2.5). Proportional mortality due to birth defects varied among racial/ethnic groups; it was greatest among Asians (27%), followed by whites (25%), Hispanics (24%), American Indians (18%), and blacks (13%). Also, infant mortality rates due to birth defects were high among minority infants of low birth weight, particularly among those born weighing between 1,500 and 2,499 g. Within this group of infants, proportional mortality due to birth defects ranged from 52% among Asians to 29% among blacks. These data indicated that birth defects were an important contributor to infant mortality among all racial/ethnic groups. Birth-defects surveillance systems should be used to evaluate whether racial/ethnic differences in infant mortality from birth defects are due to differences in incidence and/or survival among minority infants with birth defects.

INTRODUCTION

Birth defects are the leading cause of infant mortality in the United States (*1*) and the fifth leading cause of years of potential life lost (YPLL) (*2*). Also, birth defects contribute substantially to childhood morbidity and long-term disability. Approximately 80,000 infants are born with a major birth defect in the United States each year. Of these, approximately 6,000 die during the first 28 days of life, and another 2,000 die before reaching their first birthday, leaving 72,000 living children affected to various degrees (*3*). Children with birth defects account for approximately 25%-30% of pediatric hospital admissions; total costs for care of children with birth defects exceed $1 billion annually (*4,5*). Using reported age-specific survival rates and age-specific medical-care costs, CDC estimates that $90 million (based on the 1985 value of the dollar) will be spent on medical care in 1990 for 12,000 surviving infants with spina bifida born since 1980 (*6*).

All segments of the U.S. population share the burden of birth defects, with frequency and type varying by race, ethnicity, and socioeconomic status (*7-11*).

Between 1981 and 1986, American Indians showed the highest incidence rates of major defects per 1,000 total births (22.0). Other minorities had lower rates: blacks (18.0), Hispanics (14.4), and Asians (15.8) (*12*). In comparison, the incidence of major defects was 19.0/1,000 live births among whites.

This report summarizes the contribution of birth defects to infant mortality among racial/ethnic minorities.

METHODS

Information on birth and death data was obtained from NCHS' linked birth/infant death data set for the 1983 birth cohort, which consists of two separate data files (*13*). Information on births and deaths was obtained from NCHS' natality statistical file and NCHS' mortality statistical file. The numerator file contained information from birth and death certificates concerning infants born in 1983 who died in 1983 or 1984 before their first birthday. The denominator file included information from birth certificates concerning all live births for 1983. Each record contained information coded from birth and death certificates supplied by each state. Information was available on 3,341,274 live births and 39,704 infant deaths. The analysis was limited to singleton infants with known birth weight born to U.S. residents.

Birth-certificate information included information on residence; birth weight; gestational age; sex; race of baby, mother, and father; origin (or descent) of mother; plurality; and other information on pregnancy history. Death-certificate information included data on underlying and contributing causes of death. In addition, age of death, autopsy, and other identifying information was available.

Mother's race and ethnicity were used to classify infants into racial/ethnic minority groups. Twenty-three states and the District of Columbia reported racial/ethnic origin on the birth certificate. These reporting areas represented 96% of the Hispanic population. Although the remaining states did not have ethnic information included on the birth certificate, the mother's reported place of birth permitted the further identification of persons of Hispanic descent (those born in Mexico, Puerto Rico, or Cuba). Using mother's descent—in combination with mother's place of birth—permitted the delineation of Hispanic individuals who would otherwise have been classified as white.

Infants whose mothers were either of African descent or of the black race were grouped into the category "black." The category "American Indian" included American Indians, Aleuts, Eskimos, Alaskans, and Canadian Indians. "Asian" included Chinese, Japanese, Hawaiians, Filipinos, and other Asian or Pacific Islanders. Infants whose mothers reported other descent (Northern European, French, etc) or indicated they were white were included in the category "white." Only 162 (0.5%) infants had "unknown" race/ethnicity, and 13 infants were classified as "other" races. These 175 infants were excluded from the minority-group analysis.

Causes of infant mortality were coded using the *International Classification of Diseases, 9th Revision* (ICD-9). Table 1 details the ICD-9 codes included in each of the underlying cause groups. Birth defects were defined as conditions coded from 740.0 to 759.9 of the ICD-9. Conditions included in this group were heterogeneous, including defects in all organ systems with varying degrees of severity. Some "birth defects" are a result of being born prematurely, and are not birth defects per se. Among infants with low birth weight (LBW) (i.e., <2,500 g), the authors looked for birth defects that could have been a result of prematurity. These conditions were lung

hypoplasia (748.5), patent ductus arteriosus (747.0), and hydrocephalus (742.3) associated with intraventricular hemorrhage (772.1). When these conditions were associated with LBW infants, they were not considered to be birth defects. Of 34,566 infants who died in their first year of life, 1,037 had at least one of these three types of "false" birth defects. Of these, 495 had other birth defects as well, whereas 542 had false birth defects as their only birth defects listed. False birth defects were listed as the underlying cause of death for 353 infants. For these infants, the underlying cause of death was reassigned.

When describing the occurrence of birth defects among premature infants, the authors looked not only at deaths among infants with unspecified LBW (ICD-9 765, disorders relating to short gestation and unspecified LBW), but also specified LBW (ICD-9 764) and respiratory distress syndrome (RDS) (ICD-9 769). Technically, only premature infants can have RDS (or hyaline membrane disease). Although some of the infants with ICD-9 code 769 may have had respiratory distress unassociated with prematurity, we had no means of separating them from those having RDS associated with prematurity. In this analysis, the authors considered infants with the RDS code as premature. For some analyses, infants with an underlying cause of RDS, LBW, or prematurity were grouped into one category.

RESULTS

Table 2 shows the number of live births and infant deaths by race/ethnicity. Blacks had the highest infant mortality rate (18.5 deaths/1,000 live births); American Indians had the next highest rate (15.8/1,000 live births). All minority groups exceeded the 1990 objective of nine infant deaths/1,000 live births (*14*).

Figure 1 shows that, overall, birth defects were the leading cause of death in the 1983 birth cohort. Of 34,566 singleton infant deaths with known birth weight, 7,678 (22.2%) were attributed to birth defects. Low birth weight, prematurity, and RDS combined were the cause of death for 5,654 (16.4%). Sudden infant death syndrome (SIDS) was the cause of death for 5,049 (14.6%) infants.

Birth defects that contributed most to infant mortality, grouped by organ system, are shown in Table 3. Regardless of the racial/ethnic group, cardiovascular-system defects were the most commonly recorded defects on the death certificate. Central-nervous-system defects and chromosomal anomalies were also common.

TABLE 1. *International Classification of Diseases (9th Revision)*, codes for the leading underlying causes of infant mortality

Condition	ICD-9 Codes
Birth defects*	740.0-759.9
Sudden infant death syndrome	798.0
Low birth weight/prematurity	764.0-765.1
Respiratory distress syndrome	769
Intrauterine hypoxia and birth asphyxia	768.0-768.9
Unintentional injuries	800.0-949.9
Perinatal infections	771.0-771.8
Complications of placenta, cord, and membranes	762.0-762.9
Pneumonia and influenza	480.0-487.9
Maternal complications	761.0-761.9

*Excluding low birth-weight infants whose only birth defects were patent ductus arteriosus, lung hypoplasia, or hydrocephalus secondary to intraventricular hemorrhage.

In Figures 2-4, infant mortality rates, as well as the proportional mortality due to the three leading underlying causes of infant death, are shown. The underlying cause of death, by racial/ethnic group, is shown in Figure 2. Birth defects were the leading cause of infant mortality among Hispanics, Asians, and whites. Prematurity, LBW, and

TABLE 2. Number of live births and infant deaths, by race/ethnicity, United States, 1983

	Black	American Indian	Hispanic	Asian	White
Live births	501,430	27,532	219,459	75,771	2,430,985
Infant deaths	9,261	434	2,381	725	21,590
Infant mortality rate*	18.5	15.8	10.9	9.6	8.9

*Deaths per 1,000 live births.

FIGURE 1. Leading causes of infant mortality, United States, 1983

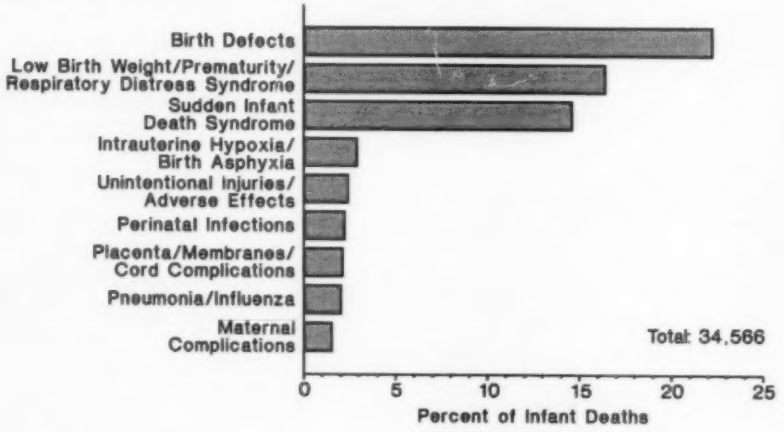


TABLE 3. Birth defects listed as underlying cause of infant death, by organ system, United States, 1986

Defect	Number	Percent
Cardiovascular system	3,198	41.7
Central nervous system	1,271	16.6
Chromosomal anomalies	721	9.4
Musculoskeletal system	642	8.4
Respiratory system	498	6.5
Genitourinary system	458	6.0
Digestive system	146	1.9
Other	744	9.7
Total	7,678	100.0

RDS combined were the leading causes of infant mortality among blacks, whereas SIDS was the leading cause of infant mortality among American Indians.

Although infant mortality varied substantially by racial/ethnic group, the rate of infant mortality due to birth defects was less variable. Infant mortality rates due to birth defects were highest among American Indians (2.9/1,000 live births), followed by Asians and Hispanics (2.6) and blacks (2.5). In comparison, white infant mortality due to birth defects was 2.3/1,000 live births.

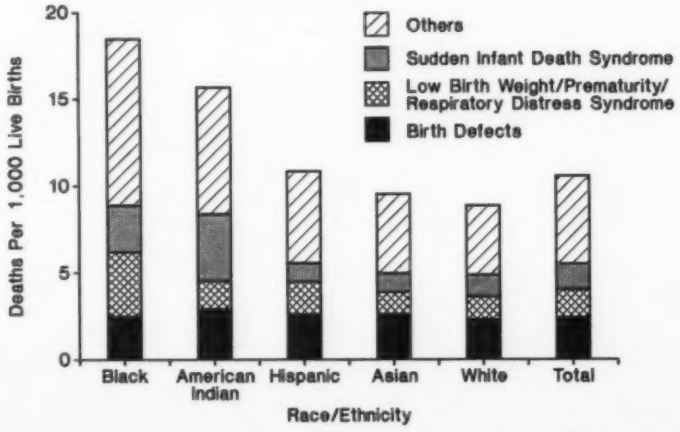
The proportional mortality due to birth defects varied greatly by racial/ethnic group. The proportional mortality was greatest among Asians (27%) and Hispanics (24%), and less among American Indians (18%) and blacks (13%). In comparison, proportional mortality among whites was 25%.

Infant mortality rates were further analyzed by age at death. Figure 3A shows infant mortality rates among infants who died in the neonatal period (<28 days of life). Again, although mortality rates varied substantially by racial/ethnic group, deaths due to birth defects were relatively constant (between 1.7 and 1.9 deaths/1,000 live births), regardless of racial/ethnic group. Low birth weight, prematurity, and RDS combined contributed the largest number of deaths during the neonatal period, especially among black infants.

Although the risk of death from birth defects was stable across racial/ethnic groups, the proportional mortality varied greatly. During the neonatal period, proportional mortality was greatest among Asians (32%), whites (30%), and Hispanics (27%) and lowest among blacks (15%) and American Indians (25%).

Figure 3B shows mortality, by racial/ethnic group, in the postneonatal period. The risk from birth defects remained relatively constant (between 0.6/1,000 live births and 1.0/1,000 live births). The largest contributor to infant mortality during the postneonatal period was SIDS; American Indians had the highest rate, and blacks had the

FIGURE 2. Underlying cause of infant mortality, by race/ethnicity, United States, 1983



next highest rate. Proportional mortality from birth defects remained relatively higher among Asians (20%), whites (18%), and Hispanics (17%) than among American Indians (12%) and blacks (11%).

Assessing infant mortality by age at death indicated that LBW, prematurity, and RDS together contributed the largest number of deaths in the neonatal period, whereas SIDS contributed the largest number in the postneonatal period. However, birth defects remained the overall leading cause of infant mortality, because neonates infrequently died from SIDS and postneonates infrequently died from LBW.

Figure 4 shows infant mortality rates by weight group (<1,500 g, 1,500 g-2,499 g, and ≥2,500 g). Infants born weighing <1,500 g had a high rate of infant mortality, with the risk of death in the first year being approximately 400 deaths/1,000 live births for

FIGURE 3. Underlying cause of infant mortality among racial/ethnic groups, by age at death, United States, 1983

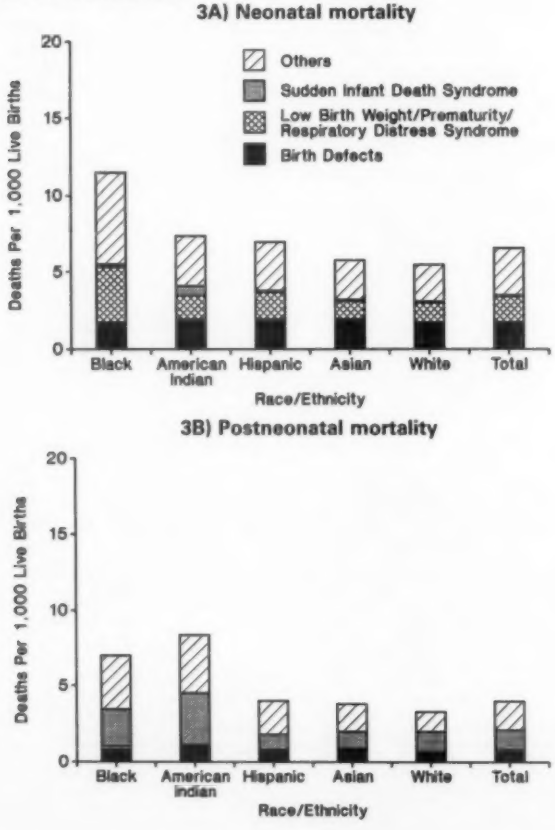
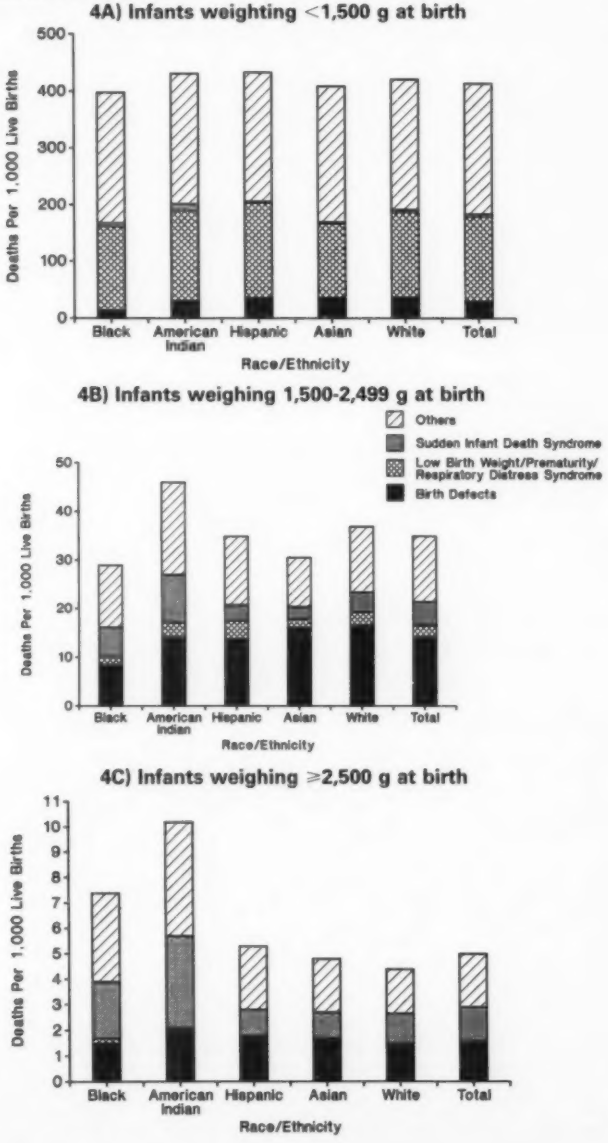


FIGURE 4. Underlying cause of infant mortality among racial/ethnic groups, by birth weight, United States, 1983



each of the racial/ethnic groups. The importance of birth defects in this group decreased compared with problems associated with prematurity and LBW. However, a relatively constant risk of death from birth defects remained. In all but the black group, the risk of death attributed to birth defects was 30-40/1,000 live births, accounting for approximately 7% of all mortality among these infants.

Among infants born weighing between 1,500 and 2,499 g, birth defects played a more important role. Asians had the highest rate of infant deaths in this group at 16.1/1,000 live births, a rate equivalent to that observed for white infants. American Indians had a rate of 14.3/1,000 live births, followed by Hispanics at 13.7/1,000 live births. Blacks had the lowest rate at 8.5/1,000 live births.

Overall, proportional mortality was high in this weight group, although it varied by racial/ethnic group. Proportional mortality was highest among Asians (52%), followed by whites (44%), Hispanics (39%), American Indians (31%), and blacks (29%).

Among infants born weighing ≥2,500 g, the risk of death from birth defects was highest among American Indians at 2.0/1,000 live births, followed by Hispanics at 1.7/1,000 live births. The remaining racial/ethnic groups had rates between 1.4 and 1.5/1,000 live births.

The proportional mortality was less in this group than in the group weighing from 1,500 to 2,499 g: whites and Asians (32%), Hispanics (31%), blacks (21%), and American Indians (20%).

Data on the underlying cause provided an incomplete picture of the factors contributing to infant mortality. Because many factors may have contributed to an infant's death, data supplying multiple causes provided a better understanding of infant mortality. The authors looked at birth defects that were listed with other causes of death. Table 4 shows the number of records with each of the 10 leading causes of death listed on the record. The percentage of records with birth defects listed are also shown. In the total population, 8,684 (25.1%) of all infant deaths had at least one birth defect listed as a contributing cause of death. Of the 13,068 infants with LBW or prematurity listed as one of the causes of death, 986 (7.5%) had birth defects also

TABLE 4. Association of birth defects with other underlying causes of infant mortality, United States, 1983

Cause	Number of deaths	Percentage of infant deaths	Number of defects	Percentage with defects
Birth defects	8,684	25.1	8,684	100.0
Sudden infant death syndrome	5,596	16.2	62	1.1
Low birth weight/prematurity	13,068	37.8	986	7.5
Respiratory distress syndrome	3,347	9.7	250	7.5
Intrauterine hypoxia and birth asphyxia	2,416	7.0	605	25.0
Perinatal infections	1,513	4.4	211	13.9
Unintentional injuries	1,567	4.5	369	23.5
Complications of placenta, cord, and membranes	961	2.8	32	3.3
Pneumonia and influenza	1,305	3.8	228	17.5
Maternal complications	781	2.3	72	9.2
Other causes	27,962	80.9	6,954	24.9
Total	34,566	100.0	8,684	25.1

listed as a contributing cause. Infants with hypoxia/asphyxia, unintentional injuries, pneumonia, and perinatal infections had a relatively high proportion of birth defects listed as well. A large proportion of infants with both birth defects and unintentional injuries listed among the multiple causes had injuries which were a result of medical or surgical procedures.

Table 5 shows data on multiple cause by racial/ethnic group. Asian infants had the largest proportion of infants with at least one birth defect listed as a multiple cause of death, whereas black infants had the smallest proportion. Substantial variation in the contribution of birth defects existed between racial/ethnic groups when looking at data on multiple causes. For example, among records with unintentional injuries listed as a multiple cause, the percentage of records with birth defects also listed ranged from 12.9% among American Indians to 28.4% among whites. On the other hand, among infants with perinatal infections listed as a cause of death, American Indians had the highest proportion of infants with birth defects also listed, whereas black infants had the lowest proportion.

DISCUSSION

Overall, birth defects were the leading cause of infant mortality. Among racial/ethnic minorities, birth defects were the leading cause of infant mortality among Hispanics and Asians.

The risk of infant death from birth defects varied among racial/ethnic groups, but for all ethnic groups, the risk was higher than for white infants. American Indians had the highest rates of lethal birth defects, followed by Asians, Hispanics, and blacks. The variation in rate of lethal birth defects among racial/ethnic groups may have been related to both incidence and survival. In turn, variation in survival may have been related to delivery and access to the health care system. These variations among racial/ethnic minorities warrant further investigation.

TABLE 5. Percentage of infant mortality associated with birth defects among racial/ethnic groups, United States, 1983

Cause	Racial/ethnic group				
	Black	Hispanic	Asian	American Indian	White
Birth defects	100.0	100.0	100.0	100.0	100.0
Sudden infant death syndrome	0.7	1.9	4.3	0.9	1.1
Low birth weight/prematurity	4.3	8.3	10.5	5.9	9.2
Respiratory distress syndrome	5.0	5.8	11.1	6.5	8.6
Intrauterine hypoxia and birth asphyxia	20.7	22.0	26.5	25.0	26.9
Unintentional injuries	14.6	20.0	20.0	12.9	28.4
Perinatal infections	9.7	14.7	13.9	16.7	15.6
Complications of placenta, cord, and membranes	1.3	9.3	4.3	0.0	3.8
Pneumonia and influenza	14.1	18.1	19.5	15.8	19.1
Maternal complications	6.6	7.7	7.7	0.0	10.4
Other causes	15.0	25.0	29.1	22.4	29.2
Total	15.2	26/5	30.5	21.0	29.1

The proportional mortality due to birth defects varied greatly by racial/ethnic group predominately because of the increased contribution of LBW, prematurity, and RDS among blacks and because of SIDS among American Indians. The proportional mortality due to birth defects was greatest among Asians, followed by whites, Hispanics, American Indians, and blacks. In addition, data on multiple causes indicated that birth defects most often contributed to infant mortality among Asians, followed by whites, Hispanics, American Indians, and blacks.

Because the proportional mortality due to birth defects varied greatly among racial/ethnic groups, the substantial gap of infant mortality that existed between minority and non-minority infants will not be ameliorated by addressing birth defects alone. Black and American Indian infants continued to have the highest rates of overall infant mortality, which probably reflected differences in access to medical care, socioeconomic status, nutrition, and maternal lifestyles. These issues should be addressed in order to close the gap represented by infant mortality rates.

Although black infants showed the highest overall rate of infant mortality, American Indian infants actually had higher rates of infant mortality when stratified by birth weight and postneonatal period. This apparent discrepancy resulted from the higher proportion of LBW infants among the black group than among the American Indian group. Although 11.7% of black infants were born weighing <2,500 g, only 5.5% of American Indians were born weighing <2,500 g. The high rates of mortality among LBW infants heavily influenced the overall mortality among blacks as compared with American Indians.

Some analysts have attributed the rapid decline of infant mortality rates in the 1970s to rising medical technology in the care of premature and other critically ill newborns. In the 1980s, this decline in infant mortality rates slowed considerably—partly because of a lack of progress in primary prevention of conditions that lead to infant death. As a consequence, the 1990 health objective of nine infant deaths/1,000 live births is unlikely to be met (*14*). Additionally, to meet the year 2000 objectives, health agencies will have to make substantial efforts to prevent the leading causes of infant mortality.

To decrease infant mortality due to birth defects, population-based surveillance systems on birth defects must continue to proliferate and expand in the United States and throughout the world (*15-17*). Collaborative epidemiologic studies are being done as part of the International Clearinghouse for Birth Defects Monitoring Systems (*18-20*) and the European Registry of Congenital Abnormalities and Twins (EURO-CAT) project (*21,22*). These surveillance systems have been invaluable resources as population-based registries for evaluation of health services and in the conduct of both descriptive epidemiologic studies and follow-up studies. One example is the large-scale case-control study conducted by the CDC between 1982 and 1984 to test whether offspring of male Vietnam veterans were at greater risk of having serious birth defects than offspring of men who did not serve in Vietnam (*23*). Cases from the existing Metropolitan Atlanta Congenital Defects Program (MACDP), which began in 1968, were studied (*24*). Similarly, collaborative efforts among state-based surveillance systems would improve the ability to perform etiologic studies of birth defects. CDC has increasingly focused efforts to standardize data-collection instruments (on the basis of the MACDP system) in order to facilitate this collaboration.

In summary, birth defects were an important contributor to infant mortality among all racial/ethnic minorities. Epidemiologic data obtained from surveillance systems

and birth-defects registries would provide the basis for the development of prevention programs for infant mortality associated with birth defects among racial/ethnic minorities. Specifically, surveillance systems on birth defects should be used to evaluate whether racial/ethnic differences in infant mortality from birth defects are due to differences in incidence and/or survival among minority infants with birth defects.

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Racial/Ethnic Differences in Smoking, Other Risk Factors, and Low Birth Weight Among Low-Income Pregnant Women, 1978-1988

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Summary

Because of the adverse effects of low birth weight (LBW) on infant morbidity and mortality, one of the 1990 health objectives for the nation has been to reduce the incidence of LBW to 5% among all live births in the United States. Public health surveillance of cigarette smoking during pregnancy has demonstrated an association between smoking and an increased risk of LBW, defined as birth weight of <2,500 g. For the period 1978-1988, information on nearly 248,000 women from CDC's Pregnancy Nutrition Surveillance System showed an LBW rate of 6.9%, a high prevalence of smoking during pregnancy (29.7%); and a strong association between smoking during pregnancy and the likelihood of delivering an LBW infant in all age, racial/ethnic, and prepregnancy weight groups. The risk of LBW was greater for smokers than for nonsmokers (9.9% versus 5.7%), creating an excess LBW risk of 4.2% associated with smoking. Overall, the average birth-weight deficit related to smoking was 178 g. Among both smokers and nonsmokers, black women had a higher percentage of LBW infants than did white women, and the risk of LBW related to smoking was greater among black women. That risk tended to increase with age, especially among women with low pregravid weight. Major reductions in LBW might be achieved if smoking were eliminated among pregnant women.

INTRODUCTION

Birth weight has been found to be the primary predictor of infant survival (*1*). The incidence of low birth weight (LBW), defined as <2,500 g (<5 lb, 8 oz), remains a major public health concern in the United States. Because two-thirds of all infants who die had LBW, the 1990 health objectives for the nation state "that low birthweight babies should constitute no more than five percent of all live births" (*2*). Blacks are disproportionately burdened by LBW. Of births in 1975, 13.1% of black infants and 6.3% of white infants had LBW (a relative risk of 2.1); in 1987, 12.7% of black infants and 5.7% of white infants had LBW (a relative risk of 2.2 for blacks) (*3*). Thus, although there has been a general decline in LBW for both blacks and whites, the approximate 2:1 black-to-white ratio has remained relatively stable. LBW data for other racial/ethnic groups are less reliable, but the LBW risks for most of these groups are more comparable with the risks for whites than those for blacks. Accordingly, the 1990 health objectives set a second birth-weight goal, that "no racial or ethnic group of the population should have a rate of low birth-weight infants that exceeds nine percent of all live births" (*2*).

Evidence clearly supports the negative effects of cigarette smoking during pregnancy on birth weight and shows a dose-response relationship between number of cigarettes smoked during pregnancy and a corresponding decline in birth weight (*4*). Intrauterine hypoxia, not decreased caloric consumption during pregnancy, is the likely mechanism that links cigarette smoking to LBW (*5*).

The 1990 health objectives, accordingly, set a goal that "the proportion of women who smoke during pregnancy should be no greater than one-half the proportion of women overall who smoke" (*2*). National estimates for 1987 indicate that 34% of women between 18 and 24 years of age smoked, whereas, for 1988, an estimated 11% of women between 12 and 17 years of age smoked (*6*). According to 1985-1986 data from 26 states participating in CDC's Behavioral Risk Factor Surveillance System, 21% of women ages 18-45 years who self-reported that they were pregnant at the time they were interviewed by telephone also reported that they were current smokers, compared with 30% of those not pregnant (*7*). These data also showed that white pregnant women were more likely to smoke (22%) than black pregnant women (16%) and that among those who smoked, white pregnant women smoked more cigarettes per day than black women.

Through the cooperation of participating state health departments, CDC's Pregnancy Nutrition Surveillance System (PNSS) monitors the prevalence of various risk factors for adverse pregnancy outcomes among low-income pregnant women who participate in publicly funded programs (*8*). Depending on local requirements, many low-income pregnant women are eligible to participate in public-sector maternal- and child-health clinic programs, such as the U.S. Department of Agriculture's Supplemental Food Program for Women, Infants, and Children (WIC). Clinic visits associated with these programs generate data records that are submitted to the PNSS. Begun in 1978, the PNSS is coordinated by the Division of Nutrition, Center for Chronic Disease Prevention and Health Promotion, CDC. In 1988, the 14 states that participated in the PNSS contributed data records concerning approximately 87,000 pregnancies.

The PNSS is part of CDC's public health surveillance effort to increase national and state capacity to quantify preventable risk behaviors during pregnancy, analyze the relationships of nutritional and behavioral status during pregnancy to birth outcomes, and intervene appropriately. This report examines the prevalence of smoking in the PNSS population and assesses the risks of delivering an LBW infant by racial/ethnic group, smoking status, pregravid weight status, and other risk factors included in the PNSS.

METHODS

To study the relationship that smoking and other risk factors have to LBW among women attending WIC clinics, the Division of Nutrition analyzed nearly 248,000 records from the PNSS. These records corresponded to pregnancies that resulted in births between January 1, 1978, and December 31, 1988, among women enrolled in WIC. Only records from states that provided data on smoking were used. Data were used from pregnancies that resulted in live, singleton births, for which the mother had at least one prenatal WIC clinic visit. Adequate data on pregnancy outcome, including infant birth weight, were also required. In order to minimize inclusion of erroneous birth weight data, records with birth weights <1,000 g and >6,000 g were excluded. Data were restricted to records from women who had either a hematocrit or hemoglobin level recorded and who, at their first WIC clinic visit, gave their ages as

between 15 and 44. All data not related to birth outcome were obtained from the first clinic visit, regardless of the pregnancy trimester in which that visit occurred. Plausibility criteria were established for gestational age, number of previous live births, height, pregravid weight, hemoglobin, and hematocrit. Unlikely values were changed to missing. Smoking status at the time of the first prenatal clinic visit was ascertained by the question, "Are you currently smoking cigarettes?"

Women were classified, on the basis of their reported pregravid weight and height, into one of three pregravid body mass index (BMI) groups: underweight, normal weight, and overweight. BMI was defined as weight(kg)/[height(m)]^2. Underweight was defined as a pregravid BMI less than the 15th percentile (<19.2 BMI units) of the National Health and Nutrition Examination Survey II (NHANES II) reference population of women between the ages 20 and 29 (*9*). Overweight was defined as a pregravid weight greater than the 85th percentile (>27.2 BMI units). Anemia status was defined according to CDC criteria (*10*). Accordingly, adjustments were made to hematocrit and hemoglobin levels among pregnant women who reported smoking. Gestational age was calculated in units of weeks from the mother's self-reported estimated date of confinement and the infant's birth date, but if the estimated date of confinement was not reported, the gestational age was estimated from the self-reported date of last menstrual period.

RESULTS

The PNSS population used for this analysis was approximately 51% white, 33% black, and 12% Hispanic (Table 1). More than half of the women were <25 years of age, and 27% were between 15 and 19 years of age. Other characteristics of the population include the prevalences of anemia (17%) and cigarette smoking (30%). Large overall differences in LBW were found between preterm and full-term infants, among racial/ethnic groups, between smokers and nonsmokers, and among pregravid BMI classifications.

The prevalence of smoking varied by age, racial/ethnic, pregravid BMI, and anemia categories (Table 2). The most striking difference in smoking prevalence was by race/ethnicity. Whites had the highest prevalence of smoking (approximately 40%) in every age group (Figure 1). However, blacks, who had only a 10% smoking prevalence in the 15- to 19-year age group, had smoking prevalences of 22% and 28% in the 20- to 24-year and 25- to 29-year age groups, respectively. Hispanics, American Indians, and Asians had the lowest smoking prevalences, which showed little variation by age.

The relationship between smoking and LBW by other factors shows that smokers had a higher risk of having an LBW child in every category (Table 2). The difference in risk for having an LBW infant between smokers and nonsmokers was found to be greatest among blacks, to increase with age, to be greater when infants were premature, and to be greatest among pregravid, underweight women.

In general, the percentage of LBW infants born to black and white women, among both smokers and nonsmokers, increased as pregravid BMI decreased (Figures 2-4). However, in every age and pregravid BMI group, for both blacks and whites, smokers had a greater risk of having an LBW infant than nonsmokers. The excess risk of LBW associated with smoking was greater for blacks than for whites and was more extreme for normal weight and underweight pregravid categories.

Because the frequency of preterm infants is not equal among the age, race, and pregravid BMI groups, an additional analysis was restricted to pregnancies that led to full-term deliveries. That analysis yielded the same relations as described previously, except for a lower proportion of LBW and a slightly diminished difference in LBW between smokers and nonsmokers.

TABLE 1. Characteristics of PNSS* participants, mean birth weights, and proportion of low birth weight, United States, 1978-1988

Characteristic	Number	Percent	Average birth weight	Low birth weight (%)
Age				
15-19	66,907	27.0	3,240	7.7
20-24	94,183	38.0	3,297	6.5
25-29	54,018	21.8	3,329	6.5
30-34	23,138	9.3	3,363	7.0
35-44	9,313	3.8	3,382	7.6
Sex of child†				
Female	122,261	49.4	3,238	7.7
Male	125,063	50.5	3,357	6.2
Race/ethnicity†				
American Indian	9,615	3.9	3,371	4.2
Asian	1,782	0.7	3,235	5.5
Black	80,168	32.5	3,180	9.3
Hispanic	28,884	11.7	3,354	5.0
White	125,912	51.1	3,356	6.1
Gestational age†				
<37 weeks	38,644	16.2	2,921	24.2
≥37 weeks	200,329	83.8	3,370	3.6
Previous live births†				
None	85,974	39.9	3,252	7.5
1	63,644	29.5	3,308	6.4
2	36,561	17.0	3,335	5.9
≥3	29,206	13.6	3,360	6.5
Pregravid body mass index†				
Underweight	40,896	17.9	3,137	10.5
Normal weight	147,389	64.6	3,295	6.7
Overweight	40,040	17.5	3,423	4.8
Anemia				
Yes	41,974	17.0	3,254	7.4
No	205,585	83.0	3,307	6.8
Smoking status				
Smoking	73,844	29.8	3,173	9.9
Not smoking	173,715	70.2	3,351	5.7
Total/Average	247,559	100.0	3,298	6.9

*Pregnancy Nutrition Surveillance System.
†These do not add up to the total population because of missing values.

DISCUSSION

The prevalence of smoking is higher among PNSS participants than it is in the general population (*6,7*). This higher prevalence may be related to the low-income status of participants in public programs. Black women had lower LBW rates in the PNSS than in the general population, whereas the LBW rates for white women in the PNSS were comparable with those in the general population (*3*).

Nevertheless, among participants in this study, clear risk factors for LBW are evident. This analysis indicates that among blacks and whites, for every age and pregravid BMI group, smokers had a greater risk of having an LBW infant than

TABLE 2. Prevalence of smoking and risk of low birth weight among PNSS* participants, by smoking status, United States, 1978-1988

Characteristic	Proportion smoking	Risk of low birth weight (%)		Risk difference†
		Smoker	Nonsmoker	
Age				
15-19	25.4	9.7	7.0	2.7
20-24	32.5	9.0	5.3	3.7
25-29	32.5	10.3	4.7	5.6
30-34	28.2	11.7	5.2	6.5
35-44	24.3	14.6	5.3	9.3
Sex of child				
Female	29.6	11.1	6.2	4.9
Male	30.1	8.7	5.1	3.6
Race/ethnicity				
American Indian	6.1	7.0	4.0	3.0
Asian	7.8	8.6	5.2	3.4
Black	19.8	14.3	8.1	6.2
Hispanic	12.8	8.1	4.6	3.5
White	42.3	8.7	4.1	4.6
Gestational age				
<37 weeks	30.6	31.3	21.1	10.2
≥37 weeks	29.7	5.7	2.7	3.0
Previous live births				
None	26.3	10.0	6.6	3.4
1	30.2	9.2	5.2	4.0
2	31.5	8.9	4.5	4.4
≥3	27.4	11.3	4.6	6.7
Pregravid body mass index				
Underweight	38.7	13.8	8.4	5.4
Normal weight	29.0	9.5	5.6	3.9
Overweight	26.2	6.7	4.1	2.6
Anemia				
Yes	38.2	9.8	5.9	3.9
No	28.1	9.9	5.6	4.3
Average	29.8	9.9	5.7	4.2

*Pregnancy Nutrition Surveillance System.
†The risk (%) of delivering a low-birth-weight infant among smokers minus the risk (%) among nonsmokers.

nonsmokers. The difference between smokers and nonsmokers in LBW risk was greater for blacks than for whites. It increased with age, and it was greatest in the pregravid underweight categories and elevated in normal weight categories when compared with overweight categories. Even among young women ages 15-19, the

FIGURE 1. Prevalence of smoking, by racial/ethnic group and age group, Pregnancy Nutrition Surveillance System, United States, 1978-1988

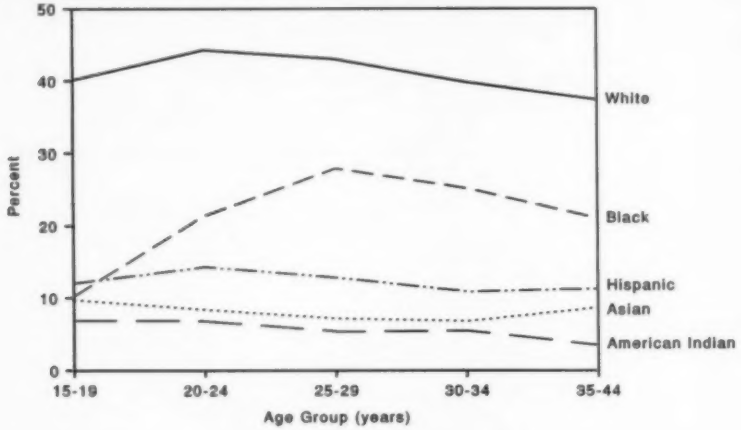
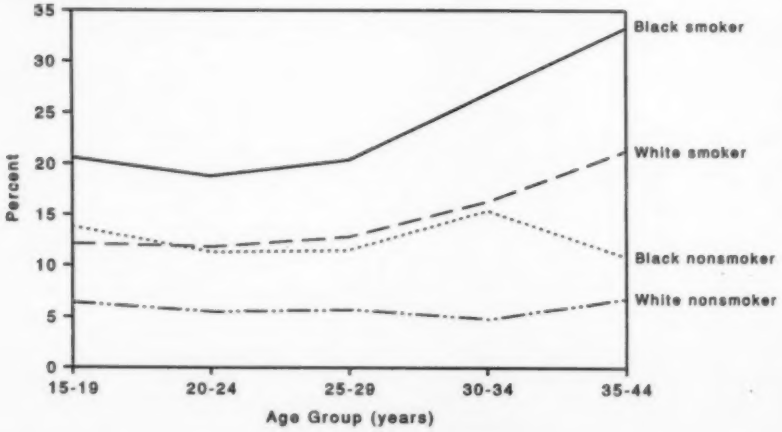


FIGURE 2. Low birth weight, by race, age group, and smoking status, among women with pregravid underweight, Pregnancy Nutrition Surveillance System, United States, 1978-1988



overall prevalence of smoking (28%) was substantial, and the LBW risk difference associated with smoking (2.7%) was elevated (*11*).

Data in the surveillance summary must be interpreted with caution because of the following limitations. The data were program-based and represented women attend-

FIGURE 3. Low birth weight, by race, age group, and smoking status, among women with pregravid normal weight, Pregnancy Nutrition Surveillance System, United States, 1978-1988

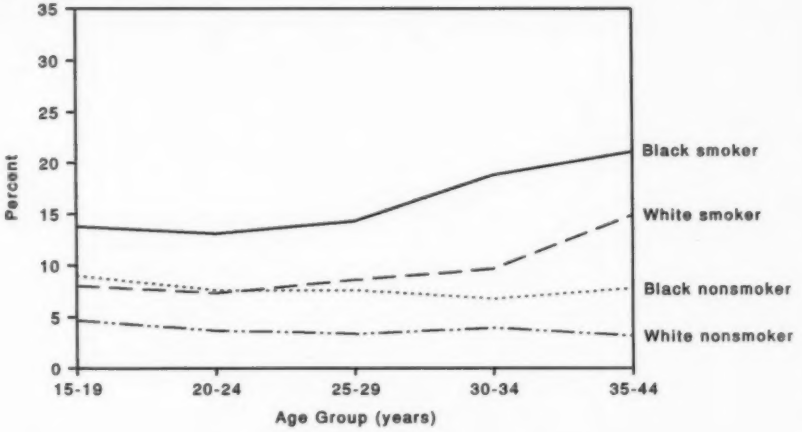
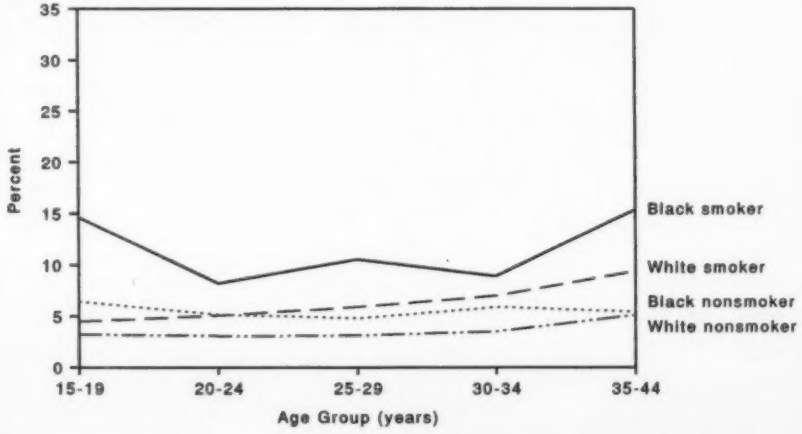


FIGURE 4. Low birth weight, by race, age, and smoking status, among women with pregravid overweight, Pregnancy Nutrition Surveillance System, United States, 1978-1988



ing WIC clinics from a nonrandom selection of 13 participating states. In many states, smoking was a selection criterion for program eligibility, which may have inflated the smoking prevalences above that of low-income women in general. Prepregnancy weight, smoking status, estimated date of confinement, date of last menstrual period, age, and number of previous live births were based on information provided by the mother at the first prenatal WIC clinic visit and were not verified. Information on birth outcomes—such as birth weight of the child—was, in most instances, based on a history provided by the mother at a postpartum clinic visit. These histories were not verified.

During the period of study from 1978 to 1988, the PNSS excluded records on pregnancies for which there was no postpartum information available. Thus, the effect on birth outcomes, especially birth weight, among women who had prenatal WIC participation but who either made no postpartum visit or for whom, for other reasons, postpartum information was unavailable, is not calculable.

Information about smoking status was self-reported at a single point during pregnancy. No information about a woman's smoking history before pregnancy or about numbers of cigarettes smoked per day during pregnancy was collected. Furthermore, other medical, social, behavioral, and dietary factors affect LBW, but data on these factors were not available (*12*). However, recent changes to the PNSS will expand the collection of data on smoking as well as on other risk factors, such as alcohol use, and will also increase the number of participating states (*8*). These improvements will enhance future analyses.

In addition to the expansion of the PNSS, CDC is assisting states in the area of maternal and child health through the Pregnancy Risk Assessment Monitoring System (PRAMS), coordinated by the Division of Reproductive Health, Center for Chronic Disease Prevention and Health Promotion. PRAMS, a population-based surveillance system now in place in seven states, collects information on maternal behaviors (e.g., smoking) during pregnancy, problems with access to prenatal care, and maternal and infant health complications. These data will also strengthen future analyses.

Despite limitations in these PNSS data, blacks, including smokers and nonsmokers, are found to be at greater risk of delivering LBW infants than are whites. Moreover, the LBW risk difference associated with smoking was greater among blacks, and it increased with age, especially among women with low pregravid weight. These results argue powerfully for smoking prevention and intervention measures directed toward low-income, pregnant women, particularly those who are at high risk for giving birth to LBW infants. CDC has initiated efforts toward this end through the Smoking Cessation in Pregnancy (SCIP) program, coordinated by the Division of Reproductive Health, which provides technical assistance to states in developing smoking-cessation programs for pregnant women.

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Surveillance for AIDS and HIV Infection Among Black and Hispanic Children and Women of Childbearing Age, 1981–1989

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Summary

Surveillance systems indicate that the most documented human immunodeficiency virus (HIV) infections and acquired immunodeficiency syndrome (AIDS) cases among children and women of childbearing age in the United States occur among black and Hispanic populations. Intravenous-drug use (IVDU) is the presumptive origin of HIV infection for most of these cases, through direct IVDU, sexual contact with an intravenous (IV)-drug user, or birth to women with either mode of exposure. These data confirm the need for HIV-prevention programs directed to the racial, ethnic, age, and reproductive concerns of black and Hispanic women of childbearing age and their children. Services should be available for those who are HIV infected, as well as for those who are not infected with HIV, to prevent the further spread of HIV. Services for prevention and treatment of drug abuse are an integral part of HIV prevention and treatment for these groups.

INTRODUCTION

The incidence of reported acquired immunodeficiency syndrome (AIDS) and the prevalence of human immunodeficiency virus (HIV) infection have been greater among Hispanics and blacks than among other racial/ethnic minority groups (*1-4*). This report focuses on this disparity among children (<15 years of age) and women of childbearing age (15-44 years of age).

METHODS

HIV/AIDS data from four sources were examined: 1) national AIDS surveillance data reported to the Division of HIV/AIDS, Center for Infectious Diseases, CDC, in 1989; 2) mortality data reported to the National Center for Health Statistics, CDC, in 1988; 3) data on HIV-antibody prevalence in specimens routinely submitted for metabolic screening of newborns from December 1987 through November 1988; and 4) data on HIV-antibody prevalence among women who applied for military service from October 1985 through December 1989.

To calculate the annual incidence of AIDS, the authors estimated the number of cases diagnosed in each year, adjusting for the delay between diagnosis and reporting. Annual incidence data for 1989 were excluded, because this adjustment is less reliable for the most recent year. To compare AIDS surveillance and mortality data with population data, the authors excluded residents of U.S. territories

(e.g., Puerto Rico, Virgin Islands), because postcensus projections and population data specific for age, sex, and racial/ethnic minority group were unavailable for U.S. territories. To estimate the non-Hispanic white population, the authors assumed all Hispanics to be white (*5*), and their number was subtracted from the white population (Irwin R. Demo-Detail, unpublished postcensus estimates recorded on computer tape, adjusted to agree with the Census Bureau's national estimates by age, sex, and race in *Current Population Reports*, Series P-25, No. 1022). Asians and Pacific Islanders were assumed to represent 79% of the population other than whites and blacks, and American Indians and Alaskan Natives were assumed to represent 21% of this "other" population (the same distribution estimated for 1980).

Mortality data are provisional, based on a 10% sample of death certificates for U.S. deaths in 1988 (*6*). Deaths due to AIDS or other HIV disease were assumed to be those in which the underlying cause of death was assigned code 042, 043, or 044, according to the *International Classification of Diseases, 9th Edition* (*7*). Hispanics were not separated from whites or other racial/ethnic groups in analysis of mortality data.

The prevalence of HIV infection among childbearing women was determined by anonymously testing blood for antibodies to HIV by the enzyme immunoassay (EIA) and Western blot methods. Blood samples were routinely collected from newborn infants for diagnosis of hereditary metabolic disorders. The prevalence of HIV antibody in these samples measures the prevalence of HIV infection among childbearing women because maternal antibody is transferred to the infants before birth, sample selection is relatively unbiased, and blood specimens are available for >90% of births.

RESULTS

HIV/AIDS Morbidity and Mortality

Hispanic and black children and women of childbearing age have accounted for a disproportionate share of AIDS cases compared with the proportion of the U.S. population they represent (Figures 1, 2). The annual incidence of AIDS among children and women of childbearing age in the United States has been increasing every year for most racial/ethnic groups but has been persistently higher among blacks and Hispanics than among other groups (Figures 3, 4).

Most AIDS cases among women of childbearing age have been related to intravenous (IV)-drug use, either directly (by IV-drug users sharing needles or syringes) or indirectly (by sexual contact with an IV-drug user) (Table 1). Among blacks and Hispanics, most cases among children have been indirectly related to IV-drug use (by perinatal transmission to an infant or fetus from a mother who used IV drugs or whose sex partner used IV drugs) (Table 2). The proportion of pediatric cases related to IV-drug use has been smaller among other racial/ethnic groups.

The mortality rate from HIV/AIDS per 1,000,000 population for black and white women, respectively, was 1.8 and 0.4 among those 15-24 years of age, 15.1 and 1.5 among those 25-34 years of age, and 16.9 and 1.7 among those 35-44 years of age. Among women 25-34 years of age, HIV-related deaths accounted for 11% and 3% of all deaths among black and white women, respectively. Overall, 1,010 deaths (6.4/100,000) occurred among black females and 880 deaths (0.8/100,000) among white females for all ages combined (*6*).

FIGURE 1. Percentage distribution of AIDS cases among women 15–44 years of age, reported 1981–1989, compared with estimated population of women 15–44 years of age in 1988 (the median year of AIDS report), by race/ethnicity, United States

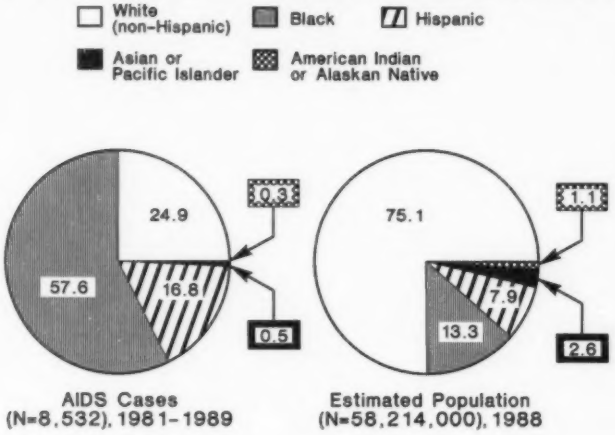

FIGURE 2. Percentage distribution of AIDS cases among children <15 years of age, reported 1981–1989, compared with estimated population of children <15 years of age in 1988 (the median year of AIDS report), by race/ethnicity, United States

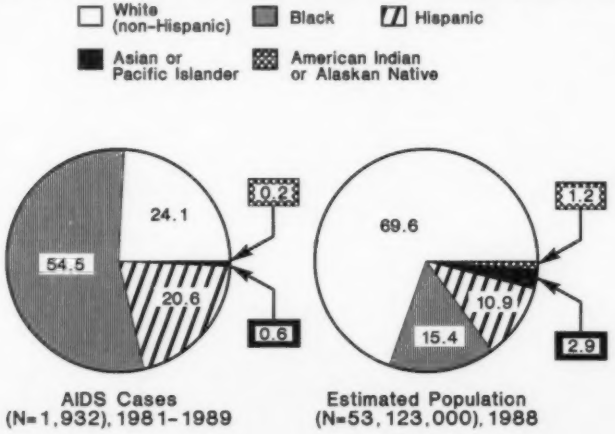

FIGURE 3. Annual incidence (adjusted for reporting delays) of AIDS among women 15–44 years of age, by race/ethnicity and year of diagnosis, United States, 1982–1988

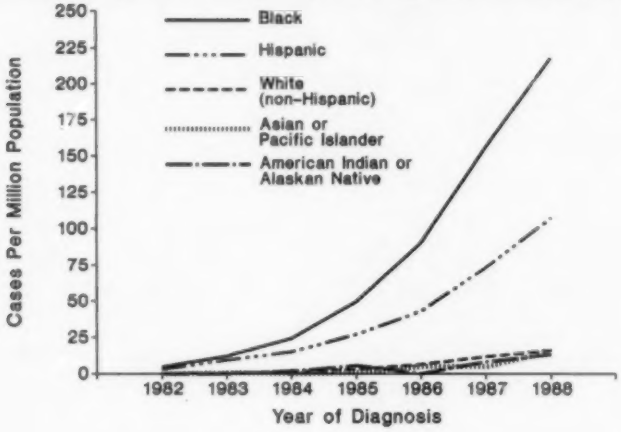

FIGURE 4. Annual incidence (adjusted for reporting delays) of AIDS among children <15 years of age, by race/ethnicity and year of diagnosis, United States, 1982–1988

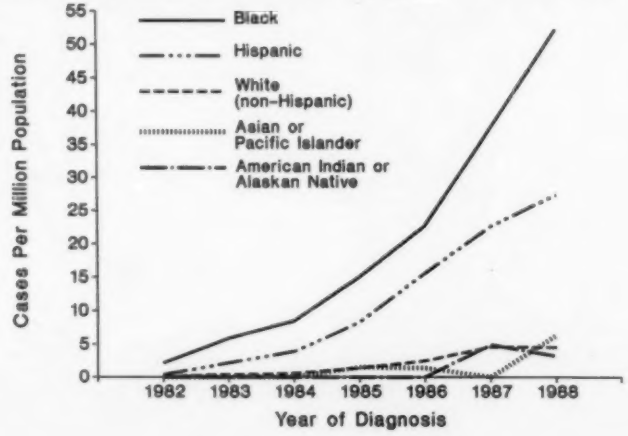

**TABLE 1. AIDS cases reported during 1981-1989 among women age
United States***

Exposure category†	White (non-Hispanic) No.	(%)	Black (non-Hispanic) No.	(%)	Hi No.
Intravenous (IV)-drug abuse	1,133	(53.4)	2,948	(60.0)	784
Hemophilia/coagulation disorder	18	(0.8)	3	(0.1)	
Sex with IV-drug user	366	(17.2)	900	(18.3)	442
Sex with bisexual man	137	(6.4)	108	(2.2)	3
Sex with man with hemophilia	32	(1.5)	2	(0.0)	
Sex with man born in a pattern-II country¶					
Women born in pattern-II country	1	(0.0)	387	(7.9)	
Women born elsewhere	1	(0.0)	28	(0.6)	
Sex with transfusion recipient with HIV infection	14	(0.7)	3	(0.1)	
Sex with HIV-infected man with unspecified mode of exposure	77	(3.6)	130	(2.6)	3
Receipt of blood transfusion, blood components, or tissue	221	(10.4)	124	(2.5)	5
Undetermined exposure**	123	(5.8)	278	(5.7)	7
Total	2,123	(100.0)	4,911	(100.0)	1,43

*Excluding cases among residents of U.S. dependencies, possessions, or te
†Exposure categories are hierarchically ordered; women with multiple possib
listed first.
§Including cases among women of unknown race/ethnicity.
¶A country in which heterosexual contact is the predominant mode of HIV t
**"Undetermined" refers to women whose mode of exposure to HIV was un
were not fully investigated because they died, were lost to follow-up, or
remained undetermined after investigation.

n ages 15-44 years, by exposure category and race/ethnicity,

Race/ethnicity							
Hispanic		Asian or Pacific Islander		American Indian or Alaskan Native		Total[5]	
No.	(%)	No.	(%)	No.	(%)	No.	(%)
784	(54.7)	9	(21.4)	14	(63.6)	4,898	(57.2)
1	(0.1)	0	(0.0)	0	(0.0)	22	(0.3)
442	(30.8)	10	(23.8)	2	(9.1)	1,725	(20.2)
35	(2.4)	4	(9.5)	1	(4.6)	286	(3.3)
1	(0.1)	1	(2.4)	0	(0.0)	36	(0.4)
2	(0.1)	1	(2.4)	0	(0.0)	393	(4.6)
0	(0.0)	0	(0.0)	0	(0.0)	29	(0.3)
4	(0.3)	0	(0.0)	0	(0.0)	21	(0.2)
37	(2.6)	3	(7.1)	3	(13.6)	250	(2.9)
53	(3.7)	11	(26.2)	1	(4.6)	410	(4.8)
75	(5.2)	3	(7.1)	1	(4.6)	486	(5.7)
1,434	(100.0)	42	(100.0)	22	(100.0)	8,556	(100.0)

, or territories.

possible means of exposure to HIV were tabulated only in the category

HIV transmission.

as unknown, including a) women under investigation; b) women who
p, or refused an interview; and c) women whose mode of exposure

TABLE 2. AIDS cases reported during 1981-1989 among children ≤
United States*

Exposure category†	White (non-Hispanic) No.	(%)	Black (non-Hispanic) No.	(%)	H
Male homosexual contact	0	(0.0)	1	(0.1)	
Hemophilia/coagulation disorder	96	(20.6)	17	(1.6)	
Mother was intravenous (IV)-drug user	114	(24.5)	483	(45.8)	
Mother had sex with IV-drug user	47	(10.1)	153	(14.5)	
Mother had sex with bisexual man	13	(2.8)	17	(1.6)	
Mother had sex with person with hemophilia	5	(1.1)	1	(0.1)	
Mother had sex with man born in a pattern-II country¶					
Mother born in pattern-II country	2	(0.4)	169	(16.0)	
Mother born elsewhere	0	(0.0)	6	(0.6)	
Mother had sex with transfusion recipient with HIV infection	5	(1.1)	3	(0.3)	
Mother had sex with HIV-infected man with unknown mode of exposure	10	(2.2)	27	(2.6)	
Mother received blood transfusion, blood components, or tissue	11	(2.4)	13	(1.2)	
Mother had HIV infection but unspecified mode of exposure	25	(5.4)	81	(7.7)	
Receipt of blood transfusion, blood components, or tissue	125	(26.9)	48	(4.6)	
Undetermined exposure**	12	(2.6)	35	(3.3)	
Total	465	(100.0)	1,054	(100.0)	

*Excluding cases among residents of U.S. dependencies, possessions, or
†Exposure categories are hierarchically ordered; children with multiple
category listed first.
§Including cases among children of unknown race/ethnicity.
¶A country in which heterosexual contact is the predominant mode of HI
**"Undetermined" refers to children whose mode of exposure to HIV wa
who were not fully investigated because they died, were lost to follow-up
of exposure remained undetermined after investigation.

ren ≤15 years of age, by exposure category and race/ethnicity,

	Race/ethnicity							
nic)	Hispanic		Asian or Pacific Islander		American Indian or Alaskan Native		Total[5]	
)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
0.1)	0	(0.0)	1	(9.1)	0	(0.0)	2	(0.1)
1.6)	16	(4.0)	4	(36.4)	0	(0.0)	135	(7.0)
5.8)	185	(46.5)	1	(9.1)	2	(50.0)	785	(40.5)
4.5)	89	(22.4)	0	(0.0)	0	(0.0)	290	(15.0)
1.6)	6	(1.5)	0	(0.0)	0	(0.0)	36	(1.9)
0.1)	1	(0.2)	0	(0.0)	0	(0.0)	7	(0.4)
6.0)	1	(0.2)	0	(0.0)	0	(0.0)	172	(8.9)
0.6)	0	(0.0)	0	(0.0)	0	(0.0)	7	(0.4)
0.3)	1	(0.2)	0	(0.0)	0	(0.0)	9	(0.5)
2.6)	21	(5.3)	1	(9.1)	1	(25.0)	61	(3.2)
1.2)	7	(1.8)	0	(0.0)	0	(0.0)	31	(1.6)
7.7)	17	(4.3)	1	(9.1)	1	(25.0)	125	(6.4)
4.6)	39	(9.8)	3	(27.3)	0	(0.0)	215	(11.1)
3.3)	15	(3.8)	0	(0.0)	0	(0.0)	62	(3.2)
0.0)	398	(100.0)	11	(100.0)	4	(100.0)	1,937	(100.0)

ns, or territories.
ltiple possible means of exposure to HIV were tabulated only in the

of HIV transmission.
IV was unknown, including a) children under investigation; b) children
ow-up, or whose parents refused interview; and c) children whose mode

In 1988, HIV infection accounted for 360 deaths among children in the United States. Although HIV infection is not a major cause of infant mortality, it is now among the 10 leading causes of death for children 1-4 years of age. In 1988, the death rate for black children (2.1/100,000) was five times higher than the rate for white children (0.4/100,000) (*6*).

HIV-Seroprevalence Data

Published data were available from a survey for maternal HIV antibody conducted in New York State by using specimens submitted for metabolic screening of newborns (*8*). Blood specimens were submitted for an estimated 99% of all infants born in the state during the period November 30, 1987-November 30, 1988. Statewide HIV-seroprevalence rates were 0.13% for whites, 1.82% for blacks, and 1.31% for Hispanics; 1,816 births to HIV-seropositive mothers occurred during the 1-year study period, including 982 (54%) among blacks and 539 (30%) among Hispanics.

From October 1985 through December 1989, a total of 358,584 civilian female applicants for military service were tested for antibody to HIV as part of the entrance medical examination; 225 (0.06%) were seropositive. Among the women tested, seroprevalence rates were 0.02% for whites, 0.15% for blacks, and 0.08% for Hispanics (U.S. Department of Defense, unpublished data). Fifty-four of the HIV-seropositive applicants were from New York, where seroprevalence rates were 0.06% for whites, 0.54% for blacks, and 0.34% for Hispanics.

DISCUSSION

Current trends in the ongoing surveillance of HIV seroprevalence and AIDS incidence document the special needs of black and Hispanic communities for prevention of HIV infection and treatment of HIV disease among women of childbearing age and their children. Specific public health needs include education and development of skills pertaining to the prevention of HIV, HIV-antibody testing and counseling, information related to early interventions for HIV-seropositive individuals, access to these interventions, and provision of social services related to management and prevention of HIV infection.

Public health surveillance indicates that IV-drug use represents the primary route of HIV transmission among black and Hispanic women and children. Programs for preventing HIV infection among blacks and Hispanics should focus on drug-related issues in addition to precautions regarding heterosexual and homosexual contact. Drug-prevention and rehabilitation programs should include HIV-related services, and drug-treatment services should be more available within black and Hispanic communities.

State and local health agencies should provide prevention and care services through multiple sources, recognizing the socioeconomic barriers and the diverse patterns of culture and communication represented within these two racial/ethnic minority groups.

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Infant Mortality Among Racial/Ethnic Minority Groups, 1983-1984

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Summary

Infant mortality varies considerably among racial/ethnic groups in the United States. For groups other than whites and blacks, previously published rates based on the vital statistics system have been underestimated because of inconsistencies in the classification of race and Hispanic status on birth and death certificates. For this report, infant mortality rates (IMRs) are based on the 1983 and 1984 linked birth and infant-death files, and mother's race and Hispanic origin are reported in accordance with information shown on the birth certificates.

Overall, Asians have somewhat lower infant mortality rates than whites, but the rates vary from 6.0/1,000 among Japanese mothers to 9.0/1,000 among "other Asian" mothers. Hispanic mothers show even wider variation: from 7.8/1,000 among Cubans to 12.9/1,000 among Puerto Ricans. Blacks have an IMR twice as high as that for whites, and the rate for American Indians is nearly 60% above the rate for whites.

Mexicans are the third largest minority group in the United States, accounting for one-quarter million births per year. Despite a high rate of poverty and low use of prenatal care, Mexicans have approximately the same IMR (9.0/1,000) as non-Hispanic whites. Further study of this group could assist in the development of prevention strategies.

INTRODUCTION

Although infant mortality has been decreasing since the mid-1960s, progress in reducing infant mortality slowed in the 1980s. Approximately 20 countries have infant mortality rates (IMRs) lower than the IMR in the United States. A major concern related to infant mortality in the United States is the high rate among black infants. In 1987, the IMR among blacks was twice that among whites. Furthermore, the black-white ratio of IMRs has not improved since 1950 (*1*).

Although the difference between black and white infant mortality has received much attention, limited information is available on infant mortality among other minority groups in the United States. For such information to be provided on a regular basis, a national surveillance system for monitoring trends would be required. However, because of inconsistencies in the recording of race on birth and death certificates, the use of routine vital statistics for monitoring trends can be misleading for minority groups other than blacks. A better method of assessing infant mortality is to link infant death certificates with the corresponding birth certificates. These linked files provide IMRs for minorities other than blacks that differ considerably from IMRs obtained from routine vital statistics. Furthermore, because birth certificates in the United States contain more information about the mother (e.g., education, marital status, prenatal care) and the infant (e.g., birth weight, period of gestation) than death certificates, more detailed analysis is possible to identify high-risk populations and to

develop and evaluate interventions for reducing mortality among high-risk groups. The National Center for Health Statistics, CDC, has implemented a program to produce such linked files on an annual basis, beginning with the 1983 birth cohort. Data from the 1983 and 1984 cohorts are now available and are used in this report to examine IMRs among minority groups.

Infant mortality rates are usually calculated by dividing the number of infant deaths in a given year (obtained from death certificates) by the number of live births in the same year (obtained from birth certificates). Race-specific IMRs calculated in this way are valid only when the coding of race on both birth and death certificates is comparable. However, results from the 1983 and 1984 National Linked Birth-Death Files show that the coding for races other than white or black is not comparable. In studies based on these files, the race of the child on the birth certificate (used as the denominator of the usual IMR) is compared with race of the child on the death certificate (used as the numerator of the usual IMR) for all infant deaths. For whites and blacks, the race coding on the birth certificate differed from that on the corresponding death certificate in <2% of the linked files; however, 25%-40% of infant deaths among births coded as American Indian/Alaskan Native or Asian on the birth certificate were coded to a different race on the death certificate. For this reason, the IMRs for minorities other than blacks need to be tracked by using the National Linked Birth-Death Files.

METHODS

Infant mortality rates from the linked birth-death files were calculated by using the race and Hispanic origin* of the mother recorded on the birth certificate. The race of the mother was used instead of the race of the child primarily for two reasons. First, the race of the child is assigned in an arbitrary manner, depending upon the race of the mother and father. For example, if one parent is white and the other is not, the race of the child is coded as the race of the parent who is not white. Second, the race of the father is unknown for nearly 20% of the birth records compared with <1% for which the race of the mother is unknown (the race of the child is coded to the known race if one parent's race is unknown). Similarly, in approximately 4% of birth records, the mother's Hispanic origin is not recorded compared with 14% for the father's.

Infant mortality rates are presented by mother's race for the entire United States and by mother's Hispanic origin for the 23 states in which data on Hispanic origin are collected and recorded on the birth certificate. Data are aggregated for 1983 and 1984 in order to provide more stable estimates of rates based on the small numbers of deaths that occur in some minority groups.

Postneonatal mortality among normal birth-weight infants (≥2,500 g) has been used as an indicator of preventable mortality (*2*). Excluding deaths from congenital anomalies further refines this indicator. This measure is not a perfect indicator of preventable mortality, because some congenital anomalies are not lethal when optimal medical care is given, and other deaths among these infants could not be prevented even with the best of medical care. Nevertheless, as a practical indicator, this measure has the advantage of being easily implemented. This method is also least subject to reporting differences among population subgroups. Thus, for this

*For reporting purposes, "Hispanic" is defined as "a person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race."

report, preventable mortality among minority groups was estimated by using postneonatal mortality among normal birth-weight infants from all causes except congenital anomalies.

RESULTS

Table 1 shows infant, neonatal, and postneonatal mortality rates by racial/ethnic category. Japanese mothers had substantially lower IMRs than any other group. This advantage was evident in both the neonatal and postneonatal period. Cuban mothers, however, had even lower postneonatal rates than Japanese mothers.

Black mothers had the highest rates, followed by American Indians and Puerto Ricans. American Indians had relatively low neonatal mortality but the highest postneonatal mortality rates of all the groups. They are unique in that more than half of their infant deaths occurred in the postneonatal period compared with approximately one-third for the other groups.

The five leading causes of infant death are shown in Table 2. Congenital anomalies were the leading cause for all groups except blacks and American Indians; in these groups, sudden infant death syndrome (SIDS) ranked first. Of all the causes of death, congenital anomalies showed the least variation among ethnic groups: from 198/100,000 live births among Cubans to 255/100,000 among Puerto Ricans. SIDS mortality, on the other hand, showed the greatest variation. SIDS rates among blacks were twice as high as those among whites, and SIDS rates among American Indians

TABLE 1. Infant mortality rates, by maternal racial/ethnic category, United States, 1983-1984

Racial/ethnic category	Live births	Neonatal	Postneonatal	Infant
		(Rates per 1,000 live births)		
All	7,308,382	7.0	3.7	10.7
White	5,884,364	6.0	3.2	9.1
Black	1,126,605	12.2	6.5	18.7
American Indian	65,722	6.9	7.4	14.3
Asian	192,318	5.5	3.1	8.6
Chinese	27,563	4.9	3.4	8.3
Japanese	14,663	3.6	2.4	6.0
Filipino	34,612	5.4	3.0	8.5
Other Asian	115,480	5.8	3.2	9.0
Other	2,940	12.2	1.7	13.9
Unknown	36,433	11.6	3.5	15.0
Based on 23 states in which data on Hispanic origin are collected:				
Hispanic origin				
Mexican	447,743	5.8	3.2	9.0
Puerto Rican	68,196	8.7	4.2	12.9
Cuban	19,210	5.7	2.1	7.8
Central and South American	67,622	5.8	2.5	8.4
Other and unknown Hispanic	82,201	6.5	3.6	10.1
Non-Hispanic origin				
White	2,785,609	5.8	3.1	8.9
Black	659,020	11.8	6.8	18.6

Source: 1983-1984 Linked Birth-Infant Death Files.

were nearly three times higher than those among whites. Asians, Cubans, Mexicans, and (especially) Central and South Americans had unusually low SIDS rates. Mortality rates from respiratory distress syndrome (RDS) and other disorders related to short gestation and low birth weight were much higher among blacks and Puerto Ricans, with the differential especially pronounced for the latter cause among blacks. Complications of pregnancy were twice as high among blacks and 35% lower among Asians than among whites.

Birth weight is strongly associated with infant mortality; therefore, data were analyzed to determine whether differences in IMRs resulted from differences in birth-weight distribution or from differences in birth-weight-specific mortality. Following methods used in other analyses (*3*), Table 3 disaggregates low birth weight (LBW) into two components: very low birth weight (VLBW) (<1,500 g) and moderately low birth weight (MLBW) (1,500-2,499 g). Blacks had nearly three times and Puerto Ricans 1.6 times the incidence of VLBW compared with non-Hispanic whites. Other minority groups showed little excess VLBW incidence. However, Chinese and Japanese mothers had 20% lower VLBW rates than whites. Blacks and Puerto Ricans had high MLBW rates, but some of the other groups—Filipinos, other Asians, and other and "unknown Hispanics" (i.e., Hispanic mothers whose Hispanic origin is not known)—also had MLBW rates 30%-40% above the rate for whites. Although Japanese mothers had low VLBW rates, they had somewhat higher MLBW rates than

TABLE 2. Infant mortality rates for five leading causes of death, by maternal race and Hispanic origin, United States, 1983-1984

Racial/ethnic category	All causes	Congenital anomalies*	SIDS†	RDS§	LBW¶	Complications**
	(Rates per 100,000 live births)					
White	912.9	227.3	120.9	86.8	62.1	32.4
Black	1,870.9	240.5	240.8	156.9	224.6	70.0
American Indian	1,428.7	245.0	343.9	97.4	70.0	32.0††
Asian	858.5	246.5	95.2	66.0	56.7	21.3
Based on 23 states in which data on Hispanic origin are collected:						
Hispanic origin						
Mexican	899.2	211.1	84.4	96.5	67.2	27.0
Puerto Rican	1,287.5	255.1	137.8	170.1	111.4	16.1††
Cuban	780.8	197.8	83.3††	83.3††	62.5††	52.1††
Central and South American	835.5	218.9	53.2	100.6	73.9	23.7††
Other and unknown Hispanic	1,008.5	233.6	152.1	97.3	77.9	28.0††
Non-Hispanic origin						
White	894.1	225.6	117.4	86.9	59.3	31.3
Black	1,857.8	233.7	250.2	166.2	217.7	63.7

*ICD:740-59.
†Sudden infant death syndrome (ICD 798.0).
§Respiratory distress syndrome (ICD 769).
¶Disorders related to short gestation and unspecified low birth weight (ICD 765).
**Newborn affected by maternal complications of pregnancy (ICD 761).
††Rate based on <25 deaths.

Source: 1983-1984 Linked Birth-Infant Death Files.

whites. The high rates of both LBW components among black and Puerto Rican mothers is reflected in their high IMRs, especially from RDS and disorders related to short gestation and LBW.

Table 4 shows birth-weight-specific IMRs. Little variation among minority groups was found in mortality for VLBW infants, although Japanese and Filipino mothers had particularly low rates. American Indian mothers had nearly 50% greater IMRs for MLBW infants than did white mothers, whereas Japanese, Filipino, and Cuban mothers had rates approximately 40% lower. The IMRs among normal birth-weight infants were particularly high for black, American Indian, and Puerto Rican mothers.

Tables 3 and 4 imply that the high IMRs among blacks and Puerto Ricans were due to adverse outcomes for both birth weight and birth-weight-specific survival. The high IMR among American Indians, on the other hand, was due almost entirely to poorer birth-weight-specific survival.

Postneonatal mortality rates among normal birth-weight infants (excluding congenital anomalies) provide an indicator of preventable mortality. American Indians had the highest rate, almost three times the rate for whites (Table 5). Blacks had twice the rate of whites. Puerto Ricans were the only other group with an elevated risk (29% above the rates for whites). If these groups could achieve the same rate of postneonatal mortality (excluding congenital anomalies) among normal birth-weight infants as the white non-Hispanic group, the overall IMR would decline by almost 25% among American Indians, 10% among blacks, and 5% among Puerto Ricans. Asians, Mexicans, and Central and South Americans had similar rates; other and unknown Hispanics had a somewhat higher risk (16% above whites).

TABLE 3. Low-birth-weight components, by maternal race and Hispanic origin, United States, 1983–1984

Racial/ethnic category	Birth weight (g)		
	<1,500	1,500-2,499	Total (<2,500)
	(Rates per 1,000 live births)		
White	9.3	47.2	56.4*
Black	26.0	101.1	127.1
American Indian	10.4	51.2	61.6
Asian	8.9	56.7	65.6
Chinese	7.5	42.7	50.2
Japanese	6.8	52.2	59.0
Filipino	9.9	65.9	75.8
Other	9.3	57.8	67.1
Based on 23 states in which data on Hispanic origin were collected:			
Hispanic origin			
Mexican	9.4	47.7	57.2*
Puerto Rican	14.8	74.3	89.0*
Cuban	10.0	47.2	57.2
Central and South American	10.3	49.7	60.0
Other and unknown Hispanic	10.7	60.0	70.7
Non-Hispanic origin			
White	9.1	47.2	56.4*
Black	25.8	101.1	126.9

*Numbers do not add because of rounding.

Source: 1983-1984 Linked Birth-Infant Death Files.

TABLE 4. Birth-weight-specific infant mortality rates, by maternal race and Hispanic origin, United States, 1983–1984

Racial/ethnical category	Birth weight (g)		
	<1,500	1,500-2,499	(≥2,500)
	(Rates per 1,000 live births)		
White	395.9	31.0	4.0
Black	375.6	25.5	6.6
American Indian	366.7	45.3	8.4
Asian	358.4	24.5	3.9
Chinese	388.3	30.6	4.1
Japanese	290.0	18.3	3.0
Filipino	303.2	20.2	4.1
Other	376.8	25.6	3.9
Based on 23 states in which data on Hispanic origin are collected:			
Hispanic origin			
Mexican	391.4	29.0	4.0
Puerto Rican	377.1	26.3	5.4
Cuban	395.8	18.8	3.1
Central and South American	337.2	24.7	3.4
Other and unknown Hispanic	374.4	29.1	4.3
Non-Hispanic origin			
White	393.2	31.0	3.9
Black	371.3	25.1	6.8

Source: 1983-1984 Linked Birth-Infant Death Files.

TABLE 5. Postneonatal mortality from all causes except congenital anomalies among normal-birth-weight infants, United States, 1983–1984

Racial/ethnic category	Number of deaths	Rate per 1,000 livebirths
White	10,921	2.0
Black	3,787	3.9
American Indian	343	5.6
Asian	331	1.8
Based on 23 states in which data on Hispanic origin are collected:		
Hispanic origin		
Mexican	843	2.0
Puerto Rican	155	2.5
Cuban	23	1.3
Central and South American	88	1.4
Other and unknown Hispanic	171	2.2
Non-Hispanic origin		
White	5,075	1.9
Black	2,342	4.1

Source: 1983-1984 Linked Birth-Infant Death Files.

DISCUSSION

Infant mortality among racial/ethnic minority groups in the United States varies widely. For groups other than whites and blacks, previously published rates based on the usual vital statistics system have been underreported because of inconsistencies in the classification of race and Hispanic status on birth and death certificates. Now that a national system of linked birth and death records is available, surveillance of these groups will be possible.

Infant mortality rates based on linked files differ in other respects from the those based on routine vital statistics. In particular, they are measures of risk for the birth cohort, i.e., they measure the probability of death among the cohort of live births, whereas the usual IMR is a ratio of deaths to births occurring in the same calendar year. However, some deaths are not accounted for because of the lack of a match on birth files. In 1983, 1.6%—and in 1984, 2.2%—of the infant deaths could not be matched to a birth certificate.

Overall, Asians had somewhat lower IMRs than whites, but the rates varied from 6.0/1,000 among Japanese mothers to 9.0/1,000 among "other Asian" mothers. Hispanic mothers showed even wider variation: from 7.8/1,000 among Cubans to 12.9/1,000 among Puerto Ricans, with Mexicans (the largest group) having about the same rate (9.0/1,000) as non-Hispanic whites. Blacks had an IMR twice as high as that of whites, and the rate for American Indians was nearly 60% above that of whites. Other studies have shown considerable variation in infant mortality among different American Indian communities (*4*).

Congenital anomalies were the leading cause for all groups except blacks and American Indians (for whom SIDS ranked first). SIDS mortality varied the most, with rates being twice as high among blacks and nearly three times as high among American Indians as they were among whites. Cubans, Mexicans, and (especially) Central and South Americans had unusually low SIDS rates. Mortality rates from RDS and other disorders related to short gestation and LBW were much higher among blacks and Puerto Ricans.

These results are consistent with data on birth-weight distribution among live births. Blacks and Puerto Ricans had a higher incidence of VLBW and MLBW than non-Hispanic whites. The other minority groups had little excess VLBW.

Infant mortality varied little among the minority groups for VLBW infants, and only American Indian mothers had substantially higher IMRs than white mothers for MLBW infants. However, this lack of variation should be interpreted with caution for two reasons. First, finer birth-weight intervals need to be used in these ranges because of the very steep gradient in IMR with increasing birth weight and the differences in birth-weight distribution among minority groups. Second, some investigators argue that comparison of birth-weight-specific mortality should be made with explicit reference to the birth-weight distribution (*5*). That is, birth-weight-specific mortality rates in two populations with different mean birth weights should be compared on the basis of how far a particular birth weight is from the mean, rather than using the absolute value of the birth weight. When additional years of data become available, such detailed analysis will be possible.

The high IMRs among normal-birth-weight infants for black, American Indian, and Puerto Rican mothers identifies a problem that would be evident even with more detailed birth-weight-specific analysis. A further refining of this comparison by using postneonatal mortality among normal birth-weight infants (excluding congenital

anomalies) as an indicator of preventable deaths shows that American Indians had three times and blacks had twice the risk of preventable deaths that whites had. If these groups could achieve the rate among whites, their overall IMRs would decline by nearly 25% among American Indians and 10% among blacks.

Risk profiles for these minority groups varied widely. Blacks, American Indians, Puerto Ricans, and Mexicans had the lowest proportion with prenatal care beginning in the first trimester (approximately 60% in 1984) compared with nearly 80% for non-Hispanic whites, Cubans, and Asians (*1*). The proportion of births to unmarried mothers was highest among blacks (59% in 1984), Puerto Ricans (51%), and American Indians (40%). Mexicans had a lower proportion (24%), but it was still above the proportions for Cubans (16%), non-Hispanic whites (11%), and Asians (10%). The proportion of births to teenagers was higher among blacks (24%), Puerto Ricans (21%), American Indians (20%), and Mexicans (18%) than among non-Hispanic whites (11%), Cubans (9%), and Asians (6%).

The low IMR among Mexicans is of particular interest because Mexican mothers have relatively high maternal risk profiles compared with non-Hispanic whites. Another finding is that American Indians have risk profiles that are nearly as high as those of blacks, yet their incidence of LBW and their neonatal mortality rates are only 10%-15% above those of whites.

Some of these anomalous results could be due to underreporting of infant deaths and live births of VLBW. For example, illegal immigrants have incentives to obtain U.S. birth certificates for infants who survive but to avoid the reporting of infants who die shortly after birth (*6*). Specific studies based on field work outside the hospital and vital statistics system could help clarify this issue.

Continued surveillance of infant mortality among minority groups in the United States is important for several reasons. Black mothers are at particularly high risk of virtually all adverse pregnancy outcomes. Puerto Rican mothers have an intermediate risk, between the risks for blacks and whites. American Indians are at especially high risk for postneonatal mortality. Each of these minority groups will have population targets set up in the year 2000 objectives. Mexicans are the third largest minority group in the United States, accounting for one-quarter million births per year. They appear to have relatively good pregnancy outcomes, despite a high rate of poverty and low use of prenatal care. Further study of this group might provide helpful information for prevention strategies.

Further specificity of minority-group categories would also be helpful. The group "other Asian or Pacific Islanders" is now the largest Asian group and the one with the highest IMR. Specific groups within this category may warrant special attention. Similarly, the group "other and unknown Hispanic" is the second largest category of Hispanic births. Coding of birth certificates does not allow this group to be further subdivided; therefore, whether the unknown Hispanic is the dominant category within this group cannot be determined. The further consideration of coding guidelines and the development of studies in localities with relatively large concentrations of minority groups should be encouraged.

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